Spectrum Research

Problem Statement:

Demands on aviation spectrum are increasing as aviation traffic increases and as new ATM concepts are developed and implemented. Simultaneously, interests external to aviation threaten to encroach on or reduce spectrum allocations currently assigned to aviation.

Objective:

Perform research and development on improved spectrum efficiency to meet current and long term aviation requirements, and coordinate and collaborate with relevant aviation spectrum authorities to protect aviation spectrum resources.

Product Description:

Research and technical support for the efficient use and protection of aviation spectrum

- Coordinate long-term aviation spectrum planning support
- Coordinate spectrum consequences/impacts/issues across NExTNAS-CNS research sub-projects
- Technologies for 5091-5150 MHz band
- Technologies for efficient use of spectrum

Schedule:

Tasks	FY 04	FY 05	FY 06	FY 07	FY 08
System Studies	◆				◆
Near-Term Planning	◆	*WRC-07 Preparation*		◆	
Long-Term Planning	◆				◆

Attendance List

Name	Organization	Email
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- Problem
  - New aeronautical technologies that do not meet the definition of radionavigation (i.e., communications) must go into AM(R)S spectrum
  - New allocations may be necessary, WRC 07 offers the opportunity for such changes

- Possible Solutions
  - Alternative or shared use of existing aeronautical bands
    - 5091 – 5150 MHz band (Top priority as spectrum may be lost)
      - On the WRC agenda for 2007
      - FAA exploring possible use of band for terminal area communication or multilateration
      - Multipath mitigation, security, bandwidth research (define the system)
      - Aviation/non-aviation (Non-aviation could use 5150-5250MHz band)
      - Channel scheme that uses guard bands for fixed links (fixed aeronautical allocation) within 5091-5250MHz
      - Proposal to be made to WRC to use this spectrum, make solicitation to other groups for applications to use in this spectrum

- Alternative or shared use of existing aeronautical bands (cont'd)
  - DME band (960 – 1215 MHz) may provide many aviation functions
    - GPS/Galileo will be around; could interfere
    - JTIDS could also interfere
      - » UAT dealt with this
      - » Frequency hops of JTIDS saves DME
    - Transition problems
      - » Equipage
      - » Maintain existing use
    - Portions of band are not used by JTIDS, DME, other services
    - More research and development should be done in this area
      - » Spread spectrum overlay of DME
      - » Spectrum utilization independent of function

        Must maintain safety and integrity

- Possibilities for more efficient use of current spectrum
  - Interference Mitigation Technologies
    - Robust waveforms for a given operational environment
    - Consider adjacent bands with a global view
  - New antenna technologies
    - Electronically steerable antenna technologies
      - » For addressed traffic
      - » Switched networks (can unicast or multicast from ground)
    - Wide band or multi-purpose antenna
  - ILS/VOR bands overlay can be studied for potential use
    - VHF, UHF, 75MHz
    - Currently ground transmitters, could be a problem with transmitting on aircraft
    - Airborne transmitters could interfere with other adjacent channel users
    - Antenna polarization issues
  - Use guard bands for subcarriers for multiple purposes
  - Dynamic utilization of spectrum
    - Needs definition
    - Reallocation period is an issue
    - Essential safety functions must have priority
  - Review DME/ILS/VOR channel pairing scheme to determine if uncoupling those systems would lead to more efficient spectrum utilization
    - Must consider impact on avionics

- Other issues
  - Study of current satellite frequency allocations that will support the modernization of civil aviation telecommunication systems
    - Also on the WRC agenda for 2007
  - NExTNAS-developed technologies and concepts should be examined for long-term aviation spectrum requirements
    - Justification for keeping what is available now and expanding spectrum
    - A long view and con-ops beyond 2025 to support allocation or reallocation
    - Aviation systems must be internationally standardized, therefore frequency allocations require consideration of global use
    - International frequency allocations require long term goals and political considerations

- Identification of other organizations involved
  - ICAO
  - ITU
  - NTIA/FCC
  - RTCA
  - EUROCAE
- Subproject criteria for success
  - MLS band is protected and utilized for new aviation applications
  - Sufficient aviation spectrum is available for the future of CNS
    - Increased efficiency of existing spectrum
    - Acquisition of new spectrum
- Project Criteria for success
  - Spectrum goals must be met for project success